







Title: DEVICE FOR GROUND CARE

Description of Invention

This invention relates to a device for ground, i.e. garden, landscape or yard, care, having a housing which is movable on the ground on wheels and to which there is attached a bar to enable the device to be guided manually in an operating direction by an operative; and a motor for rotatingly driving tools for treating the soil, which tools are provided in the form of a cutter shaft which is intended for scarifying a lawn surface, which is rotatably drivable and comprises cutters distributed along said shaft, or in the form of a sweeping roller intended for sweeping the ground.

Such a device is described in DE-3930123-A1. The scarifying shaft and the sweeping roller, together with driving elements to be connected to the driving belt for driving from the motor, constitute separate units individually associated with the housing. Therefore, depending on whether the device is used as a scarifying or sweeping device, it comprises only the tool required for the intended application, i.e. it has to be retooled to suit the application.

FR-2595186-A1 describes a device which is connectable to the three-point coupling device of a tractor; it comprises a shaft with ventilation discs having a star-shaped contour, with the stars penetrating the ground. The movement of the tractor and the engagement of the soil cause the shaft to rotate. Furthermore, the device comprises a roller and a brush batten for treating the lawn at the same time.

For using the device as a scarifier for lawn care, there is provided an approximately horizontally extending cutter shaft with a plurality of spaced cutters.

It is therefore the object of the invention to provide a device of the above species which is suitable for a number of applications without having to be retooled.

In accordance with the invention, the objection is achieved in that the tools are attached to the housing in such a way that the position of both tools relative to the ground is simultaneously changeable, whereby the tools may alternatively be moved into the operating position while in each case the other one is moved into an inoperative position of rest, the rotational axis of the cutter shaft and the rotational axis of the sweeping roller lying in planes which extend parallel to the rotational axis of at least one of the wheels.

The advantage of such a design is that by changing the position of the tools relative to the ground, the mode of operation can be changed. There is no need for any retooling. In this way it is possible to provide an easily operable combination device for different, changing applications and at the same time it is ensured that the degree of utilisation of the device is increased considerably. It is also advantageous to be able to provide a cost-effective combination device because in the case of two devices, the basic components would have to be provided twice (e.g. housing, motor, wheels).

According to a first embodiment of the invention it is proposed that for the purpose of setting one of the tools to the operating position or inoperative position, the housing may be pivotable around a pivot axis formed by the joint rotational axis of two wheels and that the sweeping roller and the cutter shaft are supported in the housing at a distance from one another, with the rotational axis of the wheels being arranged between the two.

In consequence, the position of the tools is changed merely by changing the position of the housing relative to the ground. This can easily be achieved by adjusting the wheels of one axle.

For this purpose, in the case of a device with four wheels with two on each of a pair of spaced joint rotational axes, with the rotational axes being arranged so as to be offset in parallel relative to one another it is proposed in respect of the wheels attached to the housing that the wheels forming the pivot axis of the housing may constitute the front wheels, that the wheels arranged at a distance therefrom may constitute the rear wheels, that the rear wheels may be

fixed to the housing by means of a cranked axle so as to be pivotable between two positions and that the rear wheels at the cranked axle may be rotatable around a rotational axis which is offset in parallel relative to a crank portion of the cranked axle supported at the housing.

The invention is put into effect by a further solution for setting the tools in that the wheels may be supported non-adjustably at the housing, that the cutter shaft and the sweeping roller may each be attached to a rocker supported at the housing so as to be pivotable between two positions, that the cutter shaft may be attached to the rocker in the operating direction of the housing behind the front wheels and the sweeping roller in front of the front wheels and that the pivot axis of the rocker may be attached between the two tools.

The pivot axis of the rocker is preferably arranged near the rotational axis of the front wheels.

According to a further embodiment of the invention, the rotational axes/axis of the sweeping roller and/or of the cutter shaft may extend parallel to the rotational axis of the wheels. However, it is alternatively possible for the rotational axis of the sweeping roller to be inclined to intersect the rotational axis of the wheels at an angle in a plane, or at a distance.

In this way it is possible for the material to be removed laterally by the sweeping roller. The sweeping roller is preferably designed in such a way that it projects at least beyond those wheels towards which it is inclined and towards whose end the material is conveyed. The sweeping roller is preferably arranged in front of the housing in such a way that it is attached in front of the front end of the housing adjoining the front wheels.

According to a further embodiment it is proposed that there may be provided a collecting device which, for the purpose of receiving the material conveyed from the ground upwardly by the tools, is attachable in two different positions of the housing, either, for receiving the scarified material, towards the cutter shaft or, for receiving the swept up material, towards the sweeping roller.

The direction of the operating movement of the housing, i.e. forward movement, requires a sweeping roller movement which corresponds to the direction of movement.

It is preferably opposed to the rotational direction of the cutter shaft. For this purpose, the tools are drivable by a reversible motor.

A particularly advantageous solution is expressed in a further embodiment of the invention in that separate driving means ensure a permanent driving connection between the cutter shaft and sweeping roller on the one hand and the motor on the other hand and that the driving means each comprise a freewheeling unit, as a result of which a torque is transmitted only in the rotational operating direction of the respective associated tool. In this way it is ensured that per rotational direction of the motor only one tool is driven, whereas the other one is stationary. The motor is preferably an electric motor, and the driving means are preferably provided in the form of a belt drive, chain drive or gear drive. If the driving means include freewheeling units, these are preferably arranged on the output shaft of the motor. They may be connected to a belt pulley or a chain gear for example, with one belt pulley or one chain gear each being intended for driving one of the two tools.

To be able to adapt the tools accurately to the respective application in their respective positions relative to the ground there may be provided adjustable stops which act either on the pivotable wheels or the rocker.

Finally, it is proposed that the cutter shaft and the sweeping roller may be drivable at different speeds, with the cutter shaft being drivable at a higher speed.

Two preferred embodiments of the invention are diagrammatically illustrated in the accompanying drawings, wherein:-

Figure 1 shows a first embodiment of a combination device in accordance with the invention with a pivotable housing, with the device being used for sweeping purposes and shown in a sectional side view (the section being such that an outer side housing wall is left out);

Figure 2 shows the first embodiment, with the device being in a position in which it is used as a scarifier;

Figure 3 shows a second embodiment with a rocker, with the sweeping roller and the cutter shaft being shown in a sectional side view and with the device being used for sweeping purposes;

Figure 4 shows the second embodiment being used as a scarifying device;

Figure 5 illustrates a modification of the second embodiment.

The device illustrated in Figure 1 comprises a housing 1 with two front wheels 2 arranged on a joint rotational axis 3 and supported separately at the housing, and with two rear wheels 4 which are arranged towards the rear housing end and which are supported at a cranked axle 5 which, by means of a crank portion 6, is held at the housing 1 so as to be pivotable around a pivot axis 7. The two rear wheels 4 are rotatably supported on spaced crank journals around a joint rotational axis 8, but at a distance from the crank portion 6. The cranked axle 5 and thus the rear wheels 4 may assume two different positions so that the housing 1 pivots around the rotational axis 3 of the two front wheels 2. The two positions are shown in Figure 1, with the position of the rear wheels 4 shown in continuous lines achieving a position of the housing 1 relative to the ground B wherein the rear end of the housing 1 is raised, i.e. it assumes the end position pivoted towards the left around the rotational axis 3. The cranked axle 5 may be associated with stops which delimit the two positions, and in addition, the stops themselves may be adjustable to achieve a precision setting. The housing 1 is associated with a bar 26 which allows the device to be guided on the ground B by an operative, the normal direction of movement of the device in operation being shown by the arrow A.

A cutter shaft 9 is rotatably supported in the housing 1 towards the rear end of same. The cutter shaft 9 comprises a plurality of cutters 10 which are distributed along the rotational axis 12 of same, which are spaced relative to one another and which comprise circumferentially distributed teeth 11. Only one of

said cutters 10 is visible because the remaining cutters 10 are arranged one behind the other in the drawing plane. For the operating direction A it is possible to drive the cutter shaft 9 in an anti-clockwise rotational direction. The cutter shaft 9 is drivable by a belt drive consisting of a belt pulley 13 associated with the cutter shaft 9, a belt 14 and a belt pulley 15 associated with the output shaft 17 of a reversible motor 25 and comprising a freewheeling unit which transmits a torque in the rotational direction opposed to the driving direction of rotation N1 of the motor 25, but freewheels in the rotational direction N1. Furthermore, a sweeping roller 18 is rotatably supported in the housing towards the front end of same about a rotational axis 19. On the shaft 20 of the sweeping roller 18 there is attached a belt pulley 21 engaged by a belt 22 which is also wrapped around a belt pulley 16 on the output shaft 17 of the motor 25. The belt pulley 16 comprises a freewheeling unit which, in the driving direction of rotation N1 of the motor 25, transmits a torque via the belt drive to the sweeping roller 18, so that the latter rotates in the rotational direction K corresponding to the rotational direction N1. The housing 1 is associated with a guiding plate 24 which is positioned in front of the sweeping roller 18 and which guides the material picked up by the sweeping roller 18 to a collecting device 23.

In the case of the position shown in Figure 1 of the housing 1 relative to the ground B, the device is used as a sweeping device. If now the cranked axle 5 is pivoted from the position indicated by continuous lines into the position indicated by dashed lines in Figure 1, causing the rear wheels 4 to assume a raised position pivoted towards the left relative to the housing 1, the housing 1 is pivoted around the rotational axis 3 of the front wheels 2, thus causing the cutter shaft 9 with the toothed cutters 10 to assume the position shown in Figure 2. At the same time, the collecting device 23 is positioned to be associated with the cranked axle 5 or the bar 26 for example, so that the material which is ejected backwardly by the cutters 10 of the cutter shaft 9 and which is picked up during the scarifying operation in the operating direction A by cutting into the turf is passed on into the collecting device 23. For driving the cutter shaft 9 for the

scarifying operation, the direction of rotation is reversed relative to the motor 25 by switching to the rotational direction N2 which is opposed to the rotational direction N1. In consequence, the freewheeling unit associated with the belt pulley 15 is activated in such a way that a torque is transmitted via the driving belt 14 onto the belt pulley 13 associated with the cutter shaft 9, with the cutters 10 being driven in the rotational direction M. The rotational direction M of the cutter shaft 9 is opposed to the rotational direction K of the sweeping roller 18. Furthermore, it can be seen that the cutter shaft 9 is arranged between the front wheels 2 and the rear wheels 4, whereas the sweeping roller 18 is arranged in front of the front wheels 2 in the housing 1.

Figures 3 and 4 show an alternative regarding the arrangement of the cutter shaft 9' and the sweeping roller 18'. In the vicinity of the rotational axis 3' of the front wheels 2', the housing 1' comprises a pivot bearing which forms the pivot axis 28 for a rocker 27 provided in the form of a double-arm lever. At its front end projecting from the housing 1', between its two arms, the rocker 27 carries the sweeping roller 18'. At the end of the two arms of the rocker 27 facing away therefrom, there is supported the cutter shaft 9' with the cutters 10' arranged thereon at a distance from one another. The front wheels 2 and rear wheels 4 are firmly arranged at the housing 1', i.e. they are at the housing 1 so as to be rotatable only and each comprise joint rotational axes 3' and 8' respectively. The position of the housing 1' relative to the ground B thus cannot be changed. The operating direction of the device is indicated by the arrow A. In the position as illustrated in Figure 3, the device is used as a sweeping device. The rocker 27 is in its end position pivoted towards the left, so that the sweeping roller 18' is lowered and the cutter shaft 9' is in the raised position. The bristles of the sweeping roller 18' move along the ground B. By means of the driving belt 22', the sweeping roller 18' is driven around the rotational axis 19' in the rotational direction K', which corresponds to a rotational movement of the output shaft 17' of the motor 25' in the rotational direction N1'. The housing 1' is provided with the collecting device 23' associated with the sweeping roller

18', with the material being transmitted to the collecting device 23' by the guiding plate 24'. The belt pulley 16' associated with the output shaft 17' of the motor 25' also comprises a freewheeling unit which, only for the rotational direction K' of the sweeping roller 18', transmits a torque of the driving motor 25' in the rotational direction N1'. The belts 14' and 22' are associated with spring-loaded tensioning rollers 29, 30 which allow for any changes in length when the rocker 27 pivots.

In a modification of this embodiment, according to Figure 5, a first drive belt 33 extends from the motor shaft 17' to a belt pulley arranged on the pivot axis 28. From two further belt pulleys 31, 32 with respective freewheeling couplings, arranged on the axis 28, further belts 34, 35 transmit the rotational movement to the sweeping roller 18' or cutter shaft 9', according to the direction of the motor 25'. The belts 34, 35 are not subject to length changes. To obtain a clearer illustration, the rocker 27 is not shown. If the device is now to be changed to act as a scarifier, the rocker 27 is moved clockwise around the pivot axis 28, so that the cutter shaft 9', by means of the teeth of its cutters 10', is able to engage the ground B, for which purpose the rocker 27 is adjusted against a stop which, in turn, is adjustable for the purpose of setting the depth of penetration of the teeth of the cutters 10' in the ground B, i.e. although it serves as a fixed stop, it permits the rocker 27 to be set in the sense of changing the position of the cutters 10' relative to the ground B. The driving direction of rotation M' for the cutter shaft 9' is opposed to the driving direction of rotation K' for operating the sweeping roller 18'. For this purpose, the direction of rotation is reversed, i.e. the motor 25' operates in a rotational direction N2' which is opposed to the driving direction of rotation N1' for the operating direction A. When the device is used for scarifying purposes, the collecting device 23' is also associated with the rear of the housing 1'.

In the case of all embodiments according to Figures 1 to 5, the speed of the sweeping roller 18, 18' is lower than that of the cutter shaft 9, 9'. The sweeping roller 18, 18' rotates in a direction which is opposed to the operating

direction A, whereas the cutter shaft 9, 9' rotates at a high speed in the operating direction A. For example, a speed of the sweeping roller 18, 18' of < 1000 r.p.m. is advantageous, whereas the cutter shaft 9, 9' rotates at a higher speed, for example at 3000 r.p.m. Furthermore, it is proposed to provide a mechanical connection between the pivot mechanism of the rear wheels 4, 4' or the rocker 27 and the switching-on device for the motor 25, 25', so that depending on the position of the housing 1, 1', or the rear wheels 4, 4', and the rocker 27, one direction of rotation is blocked.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. A device for garden, landscape or yard care, having a housing which is movable on the ground on wheels and to which there is attached a bar to enable the device to be guided manually in an operating direction by an operative; and a motor for rotatingly driving tools for treating the ground, which tools are provided in the form of a rotatable cutter shaft comprising cutters distributed along the shaft for scarifying a lawn surface, and in the form of a sweeping roller intended for sweeping the ground, wherein the tools are attached to the housing in such a way that the position of both tools relative to the ground is simultaneously changeable whereby the tools may alternatively be moved into the operating position while in each case the other one is moved into an inoperative position of rest, the rotational axis of the cutter shaft and the rotational axis of the sweeping roller lying in planes which extend parallel to the rotational axis of at least one of the wheels.
2. A device according to Claim 1, wherein, for the purpose of setting one of the tools to the operating position or inoperative position, the housing is pivotable around a pivot axis formed by the joint rotational axis of two wheels, the sweeping roller and the cutter shaft being supported by the housing at a distance from one another, with said rotational axis of the wheels being arranged between the two.
3. A device according to Claim 2, having four wheels with two on each of a pair of spaced joint rotational axes, with said joint rotational axes being arranged so as to be offset in parallel relative to one another and with the wheels being attached to the housing, wherein the wheels forming the pivot axis of the housing constitute the front wheels; the wheels arranged at a distance therefrom constitute the rear wheels; the rear wheels are fixed to the housing by means of a cranked axle so as to be pivotable between two positions, and the rear wheels

on the cranked axle are rotatable around a rotational axis which is offset in parallel relative to a crank portion of the cranked axle which portion is supported at the housing.

4. A device according to Claim 1, wherein the wheels are supported non-adjustably at the housing, the cutter shaft and the sweeping roller are each attached to a rocker supported at the housing so as to be pivotable between two positions; the cutter shaft being attached to the rocker in the operating direction of the housing behind the front wheels; the sweeping roller being in front of the front wheels and that the pivot axis of the rocker being between the two tools.

5. A device according to Claim 4, wherein the pivot axis of the rocker adjoins the rotational axis of the front wheels.

6. A device according to any one of the preceding claims, wherein the rotational axis of the sweeping roller and/or of the cutter shaft extends parallel to a rotational axis of the wheels.

7. A device according to any one of Claims 1 to 5, wherein the rotational axis of the sweeping roller is inclined so as to intersect a rotational axis of the wheels at an angle in a plane, or at a distance.

8. A device according to any one of the preceding claims, wherein the sweeping roller is arranged in front of the housing.

9. A device according to any one of the preceding claims, wherein the sweeping roller is arranged in front of the front end of the housing adjoining the front wheels.

10. A device according to any one of the preceding claims, wherein there is provided a collecting device which, for the purpose of receiving material conveyed from the ground upwardly by the tools, is attachable in two different positions of the housing, either, for receiving the scarified material, towards the cutter shaft or, for receiving the swept up material, towards the sweeping roller.

11. A device according to any one of the preceding claims, wherein the rotational direction of the cutter shaft resulting from the operating direction of the housing is opposed to the operating direction of the sweeping roller.

12. A device according to Claim 11, wherein the tools are drivable by a reversible motor.

13. A device according to Claim 12, wherein separate driving means provide a permanent driving connection between the cutter shaft and sweeping roller on the one hand and the motor on the other hand, each driving means comprising a freewheeling unit for transmitting torque only in the operating direction of the respective tool.

14. A device according to Claim 12 or Claim 13, wherein the motor is an electric motor.

15. A device according to any one of the preceding claims, comprising driving means in the form of a belt drive, chain drive or gear drive for the tools.

16. A device according to Claim 13 or Claim 14 or 15 appendant thereto, wherein the freewheeling units are arranged on an output shaft of the motor or on the pivot axis of the rocker.

17. A device according to Claim 13, or Claim 14 or 15 appendant thereto, in each case as appendant directly or indirectly to Claim 4, wherein the freewheeling units are arranged on the pivot axis of the rocker.

18. A device according to Claim 2 or Claim 4, or any claim appendant thereto, wherein the two positions are limited by adjustable stops.

19. A device according to any one of the preceding claims, wherein the cutter shaft and the sweeping roller are drivable at different speeds, the cutter shaft being drivable at a higher speed.

20. A device substantially as hereinbefore described with reference to the accompanying drawings.

21. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.



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Claims searched: 1-20

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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK CI (Ed.O): A1B BAA,BAB,BAS,BAX,BUA2; A1E EBF
Int CI (Ed.6): A01B 45/00, 45/02, 49/02, 49/04; A01G 1/12
Other: ONLINE: WPI

Documents considered to be relevant:

| Category | Identity of document and relevant passage | Relevant to claims |
|----------|---|--------------------|
| X | GB 2,268,385 A (JUKES) | 1,6,11,15 |

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